EL465780496

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Priority Application Serial No. 09/030,618
Priority Filing Date .... February 25, 1998
Inventor .... Richard Holscher et al.
Assignee .... Micron Technology, Inc.
Priority Group Art Unit 1756
Priority Examiner .... K. Duda
Attorney's Docket No. MI22-1694
Title: Semiconductor Processing Methods

PRELIMINARY AMENDMENT

To: Assistant Commissioner for Patents
Washington, D.C. 20231

From: D. Brent Kenady (Tel. 509-624-4276; Fax 509-838-3424)
Wells, St. John, Roberts, Gregory & Matkin P.S.
601 W. First Avenue, Suite 1300
Spokane, WA 99201-3828

AMENDMENTS

In the Specification

At page 1, before the "Technical Field" section, insert the following paragraph in accordance with 37 C.F.R. § 1.121(b)(1)(ii):

--**RELATED PATENT DATA**

This patent resulted from a continuation application of U.S. Patent Application Serial No. 09/030,618, filed February 25, 1998.--.

In the Claims

Please replace the claims with the following clean version of the entire set of pending claims, in accordance with 37 C.F.R. § 1.121(c)(1)(i). Cancel all previous versions of any pending claim.

A marked up version showing amendments to any claims being changed is provided in one or more accompanying pages separate from this amendment in accordance with 37 C.F.R. § 1.121(c)(1)(ii). Any claim not accompanied by a marked up version has not been changed relative to the immediate prior version, except that marked up versions are not being supplied for any added claim or canceled claim.

CLAIMS

Please delete claims 1-21.

Please add new claims 22-40.

22. (New) A semiconductor processing method comprising:

forming an antireflective material layer over a substrate;

annealing at least a portion of the antireflective material layer at a temperature of at least 550° C;

forming a layer of photoresist over the annealed antireflective material layer;

patterning the layer of photoresist; and

removing a portion of the antireflective material layer unmasked by the patterned layer of photoresist.

23. (New) The method of claim 22 wherein the layer of photoresist is formed against the antireflective material layer.

24. (New) A semiconductor processing method comprising:

forming an antireflective material layer over a substrate;

annealing the antireflective material layer at a temperature of at least 550° C;

forming a layer of photoresist over the annealed antireflective material layer; and

exposing portions of the layer of photoresist to radiation waves, some of the radiation waves being attenuated by the antireflective material during the exposing.

25. (New) The method of claim 24 wherein the attenuation comprises absorbing radiation waves with the antireflective coating.

26. (New) The method of claim 24 wherein the layer of photoresist is formed against the antireflective material layer.

27. (New) The method of claim 24 further comprising exposing the antireflective material layer to a nitrogen-containing atmosphere during the annealing.

28. (New) A semiconductor processing method comprising;

forming a solid antireflective material layer over a substrate;

altering optical properties of the antireflective material layer by annealing the antireflective material layer at a temperature greater than or equal to about 550° C;

after altering the optical properties, forming a layer of photoresist over the antireflective material layer; and

exposing portions of the layer of photoresist to radiation waves and absorbing some of the radiation waves with the antireflective material.

29. (New) The method of claim 28 further comprising exposing the antireflective material layer to an atmosphere during the altering, the atmosphere comprising at least one of nitrogen and argon.

30. (New) The method of claim 28 wherein the optical properties which are altered include at least one of a refractive index coefficient or an extinction coefficient.

31. (New) The method of claim 28 further comprising:

chemical vapor depositing the antireflective material layer onto the substrate at a temperature of from about 300° C to about 400° C; and

selectively removing either the exposed or unexposed portions of the photoresist while leaving the other of the exposed and unexposed portions over the substrate.

32. (New) A semiconductor device comprising:

a substrate; and

an annealed antireflective material layer over the substrate, wherein the annealing is achieved by exposing the antireflective material layer to a temperature of at least 550° C.

33. (New) The device of claim 32 further comprising a layer of photoresist over the antireflective material.

34. (New) The device of claim 32 wherein the antireflective material layer comprises a stack of layers.

35. (New) The device of claim 32 wherein the antireflective material layer comprises a stack of layers, at least one of the stack of layers comprising silicon dioxide.

36. (New) The device of claim 32 wherein the antireflective material layer consists of one substantially homogenous layer.

37. (New) A semiconductor device comprising:

a substrate; and

an annealed antireflective material layer over the substrate, the antireflective material layer comprising oxygen, nitrogen and silicon, and wherein the annealing is achieved by exposing the antireflective material layer to a temperature of at least 550° C.

38. (New) The device of claim 37 wherein the antireflective material layer comprises from about 5% to about 37% (by atomic concentration) oxygen, from about 10% to about 35% (by atomic concentration) nitrogen, from about 50% to about 65% (by atomic concentration) silicon, and hydrogen.

39. (New) A semiconductor device comprising:

a substrate;

an annealed antireflective material layer over the substrate, and wherein the annealing is achieved by exposing the antireflective material layer to a temperature of at least 550° C; and

at least one layer of material over the antireflective material layer, wherein the at least one layer of material is at least partially transparent to radiation utilized to pattern photoresist.

40. (New) The device of claim 39 further comprising a plurality of layers of material over the antireflective material layer, wherein all the layers of material are at least partially transparent to radiation utilized to pattern photoresist.

REMARKS

Claims 1-21 are canceled, and claims 22-40 are added. Claims 22-40 are pending in the application, and Applicant requests examination of such pending claims.

Respectfully submitted,

Dated: 6-19-01

By:

D. Brent Kenady
Reg. No. 40,045

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VERSION WITH MARKINGS TO SHOW CHANGES MADE ACCOMPANYING PRELIMINARY AMENDMENT

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In the Claims

The claims have been amended as follows. Underlines indicate insertions and ~~strikeouts~~ indicate deletions.

Please delete claims 1-21.

Please add new claims 22-40.

22. (New) A semiconductor processing method comprising:

forming an antireflective material layer over a substrate;

annealing at least a portion of the antireflective material layer at a temperature of at least 550° C;

forming a layer of photoresist over the annealed antireflective material layer;

patterning the layer of photoresist; and

removing a portion of the antireflective material layer unmasked by the patterned layer of photoresist.

23. (New) The method of claim 22 wherein the layer of photoresist is formed against the antireflective material layer.

24. (New) A semiconductor processing method comprising:

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25. (New) The method of claim 24 wherein the attenuation comprises absorbing radiation waves with the antireflective coating.

26. (New) The method of claim 24 wherein the layer of photoresist is formed against the antireflective material layer.

27. (New) The method of claim 24 further comprising exposing the antireflective material layer to a nitrogen-containing atmosphere during the annealing.

28. (New) A semiconductor processing method comprising;

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altering optical properties of the antireflective material layer by annealing the antireflective material layer at a temperature greater than or equal to about 550° C;

after altering the optical properties, forming a layer of photoresist over the antireflective material layer; and

exposing portions of the layer of photoresist to radiation waves and absorbing some of the radiation waves with the antireflective material.

29. (New) The method of claim 28 further comprising exposing the antireflective material layer to an atmosphere during the altering, the atmosphere comprising at least one of nitrogen and argon.

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chemical vapor depositing the antireflective material layer onto the substrate at a temperature of from about 300° C to about 400° C; and

selectively removing either the exposed or unexposed portions of the photoresist while leaving the other of the exposed and unexposed portions over the substrate.

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a substrate; and

an annealed antireflective material layer over the substrate, wherein the annealing is achieved by exposing the antireflective material layer to a temperature of at least 550° C.

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an annealed antireflective material layer over the substrate, and wherein the annealing is achieved by exposing the antireflective material layer to a temperature of at least 550° C; and

at least one layer of material over the antireflective material layer, wherein the at least one layer of material is at least partially transparent to radiation utilized to pattern photoresist.

40. (New) The device of claim 39 further comprising a plurality of layers of material over the antireflective material layer, wherein all the layers of material are at least partially transparent to radiation utilized to pattern photoresist.

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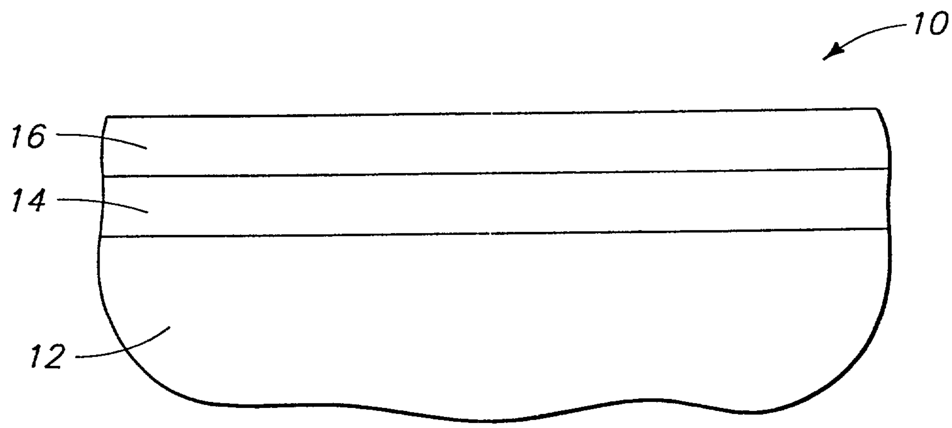

Fig 1

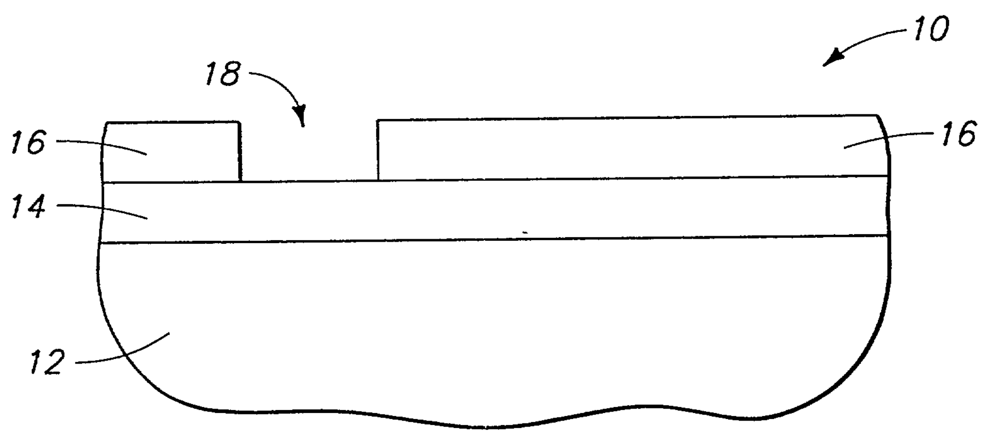

Fig 2

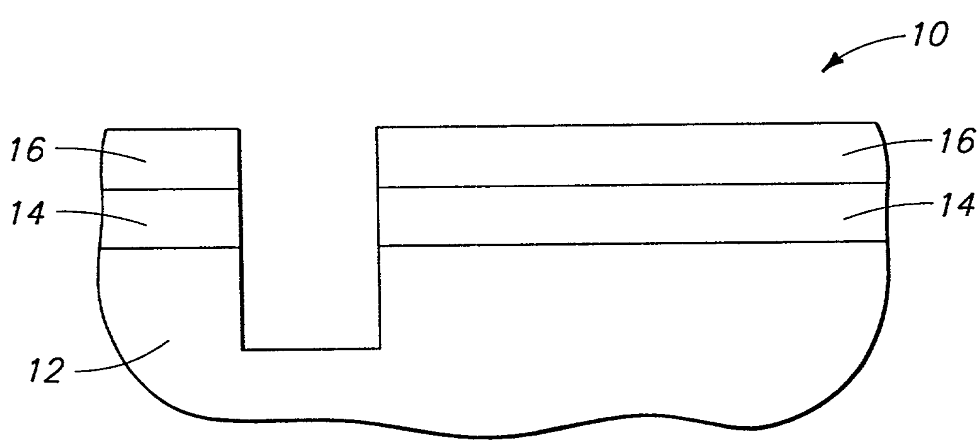

Fig 3